

## CLAIMS

What is claimed is:

1. An pharmaceutical composition comprising a SMIP compound of formula (I):  

**X-Y-Z**

(I)

wherein,

X is selected from the group consisting of substituted or unsubstituted alkyl, aryl, heteroaryl, fused arylaryl, fused heteroarylaryl, fused heteroarylheteroaryl, unfused arylaryl, unfused heteroarylaryl, unfused heteroarylheteroaryl and heterocyclyl groups;

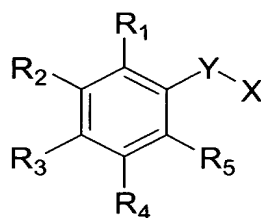
Y is a linking moiety; and,

Z is selected from the group consisting of substituted or unsubstituted aryl, heteroaryl, fused arylaryl, fused heteroarylaryl, and fused arylheteroaryl,

or a pharmaceutically acceptable salt, ester, or prodrug thereof and a pharmaceutically acceptable excipient wherein said composition elicits an immune response in a subject.

2. The composition of claim 1 wherein Y is a covalent bond or a linking moiety selected from the group consisting of -CO-, -O-, -S-, -CH<sub>2</sub>-, and -NH-.

3. The composition of claim 1 wherein the SMIP compound is compound of formula (II):



II

wherein,

Y is absent or a linking moiety;

X is selected from the group consisting of substituted or unsubstituted alkyl, aryl, heteroaryl, fused arylaryl, fused heteroarylaryl, fused heteroarylheteroaryl, unfused arylaryl, unfused heteroarylaryl, unfused heteroarylheteroaryl and heterocyclyl groups;

R<sub>1</sub> is selected from the group consisting of H, halogen, hydroxy, amino, nitro, cyano, carboxylic acid, and substituted or unsubstituted alkyl, alkenyl, alkynyl alkylamino, aminoalkyl, alkylcarbonyloxy, alkoxycarbonyl, aminocarbonyl, alkylaminocarbonyl, carbonylamino, alkylcarbonylamino, alkoxy, alkoxyalkyl, carbocyclyl, heterocyclyl, aryl, heteroaryl, fused arylaryl, unfused arylaryl fused heteroarylaryl, unfused heteroarylaryl, fused arylheteroaryl and unfused arylheteroaryl groups;

R<sub>2</sub> is selected from the group consisting of H, halogen, hydroxy, amino, nitro, cyano, carboxylic acid, and substituted or unsubstituted alkyl, alkenyl, alkynyl alkylamino, aminoalkyl, alkylcarbonyloxy, alkoxycarbonyl, aminocarbonyl, alkylaminocarbonyl, carbonylamino, alkylcarbonylamino, alkoxy, alkoxyalkyl, carbocyclyl, heterocyclyl, aryl, heteroaryl, fused arylaryl, unfused arylaryl fused heteroarylaryl, unfused heteroarylaryl, fused arylheteroaryl and unfused arylheteroaryl groups; or,

R<sub>2</sub> is taken together with R<sub>3</sub> to form a substituted or unsubstituted 5-7 membered ring consisting of all carbon atoms or 1-2 heteroatoms selected from the group consisting of O, S, N; or,

R<sub>3</sub> is selected from the group consisting of H, halogen, hydroxy, amino, nitro, cyano, carboxylic acid, and substituted or unsubstituted alkyl, alkenyl, alkynyl alkylamino, aminoalkyl, alkylcarbonyloxy, alkoxycarbonyl, aminocarbonyl, alkylaminocarbonyl, carbonylamino, alkylcarbonylamino, alkoxy, alkoxyalkyl, carbocyclyl, heterocyclyl, aryl, heteroaryl, fused arylaryl, unfused arylaryl fused heteroarylaryl, unfused heteroarylaryl, fused arylheteroaryl and unfused arylheteroaryl groups;

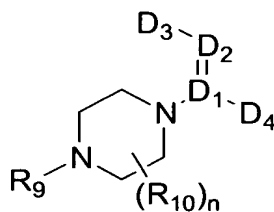
R<sub>4</sub> is selected from the group consisting of H, halogen, hydroxy, amino, nitro, cyano, carboxylic acid, and substituted or unsubstituted alkyl, alkenyl, alkynyl alkylamino, aminoalkyl, alkylcarbonyloxy, alkoxycarbonyl, aminocarbonyl, alkylaminocarbonyl, carbonylamino, alkylcarbonylamino, alkoxy, alkoxyalkyl, carbocyclyl, heterocyclyl, aryl, heteroaryl, fused arylaryl,

unfused arylaryl fused heteroarylaryl, unfused heteroarylaryl, fused arylheteroaryl and unfused arylheteroaryl groups; and  
 $R_5$  is selected from the group consisting of H, halogen, hydroxy, amino, nitro, cyano, carboxylic acid, and substituted or unsubstituted alkyl, alkenyl, alkynyl, alkylamino, aminoalkyl, alkylcarbonyloxy, alkoxy carbonyl, aminocarbonyl, alkylaminocarbonyl, carbonylamino, alkylcarbonylamino, alkoxy, alkoxyalkyl, carbocyclyl, heterocyclyl, aryl, heteroaryl, fused arylaryl, unfused arylaryl fused heteroarylaryl, unfused heteroarylaryl, fused arylheteroaryl and unfused arylheteroaryl groups,  
 or a pharmaceutically acceptable salt, ester, or prodrug thereof.

4. The composition of claim 3 wherein Y is a linking moiety is selected from the group consisting of -CO-, -O-, -S-, -CH<sub>2</sub>-, -NH-; with the proviso that an aminocarbonyl group is not formed between the attachment of Y and X.

5. The composition of claim 1 wherein the SMIP compound is selected from the group consisting of an acylpiperazine, an indoleione, a tetrahydroisoquinoline, a benzocyclodione, an amino azavinyl compound, a thiosemicarbazone, a lactam, an aminobenzimidazole quinolinone, a hydrophthalamide, a benzophenone, an isoxazole, a sterol, a quinazolinone, a pyrrole, an anthraquinone, a quinoxaline, a triazine, an benzazole, and a pyrazolopyrimidine, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

6. The composition of claim 1 wherein the SMIP compound is an acylpiperazine compound of formula (III):



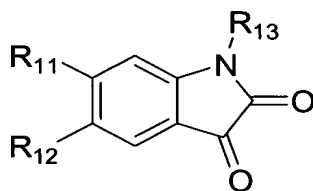
III

wherein,

$R_9$  is selected from the group consisting of substituted or unsubstituted aryl, heteroaryl, arylalkyl, arylalkenyl, heteroarylalkyl, and heteroarylalkenyl;

$R_{10}$  is substituted or unsubstituted alkyl;  
 $n$  is an integer from 0-2; and  
 if  $D_1$  is carbon then  $D_2$  is oxygen,  $D_3$  is absent, and  $D_4$  is selected from the group consisting of substituted or unsubstituted aryl, heteroaryl, carbocycl, alkoxyaryl, fused arylaryl, fused arylheteroaryl, and fused heteroarylaryl; or, if  $D_1$  is nitrogen than  $D_2$  is nitrogen,  $D_4$  is absent, and  $D_3$  is selected from the group consisting of substituted or unsubstituted aryl, heteroaryl, carbocycl, alkoxyaryl, fused arylaryl, fused arylheteroaryl, and fused heteroarylaryl, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

7. The composition of claim 1 wherein the SMIP compound is an indoledione compound of formula (IV):



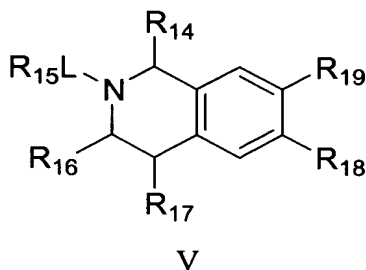
IV

wherein,

$R_{11}$  and  $R_{12}$  are independently selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxylic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocycl, heterocyclalkoxy, heterocyclalkyl, and carbocycl;

$R_{13}$  is selected from the group consisting of substituted or unsubstituted aryl, heteroaryl, arylalkyl, heteroarylalkyl, heterocycl, heterocyclalkyl, and alkylbenzyl, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

8. The composition of claim 1 wherein the SMIP compound is a tetrahydroisoquinoline compound is a compound of Formula (V):



wherein,

L is a covalent bond or selected from the group consisting of -CH<sub>2</sub>-, -CO-, -O-, -S-, CHF, -NH-, -NR<sub>20</sub>-, where R<sub>20</sub> is lower alkyl;

R<sub>14</sub> is selected from the group consisting of hydrogen, halogen, and substituted or unsubstituted alkyl;

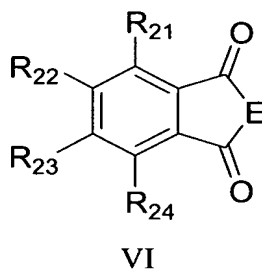
R<sub>15</sub> is selected from the group consisting of substituted or unsubstituted carbocyclyl, aryl, arylalkyl, alkoxyaryl, heteroaryl, heterocyclyl;

R<sub>16</sub> is selected from the group consisting of hydrogen, halogen, and substituted or unsubstituted alkyl;

R<sub>17</sub> is selected from the group consisting of hydrogen, halogen, and substituted or unsubstituted alkyl;

R<sub>18</sub> and R<sub>19</sub> are independently selected from the group consisting of H, hydroxy, halogen, alkoxy, amino, unsubstituted alkyl, substituted alkyl, and alkylamino, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

9. The composition of claim 1 wherein the SMIP compound is a benzocyclodione compound of formula (VI):



wherein,

E is selected from the group consisting of NR<sub>25</sub> or CR<sub>26</sub>R<sub>27</sub>;

R<sub>21</sub>, R<sub>23</sub>, and R<sub>24</sub> are independently selected from the group consisting of H, hydroxy, halogen, alkoxy, amino, unsubstituted alkyl, substituted alkyl, and alkylamino;

R<sub>22</sub> is selected from the group consisting of H, hydroxy, halogen, alkoxy, amino, and unsubstituted or substituted alkyl, and alkylamino, arylalkyl, heteroarylalkyl, aryl, heteroaryl, arylcarbonyl, heterocyclyl, heterocyclalkyl, and heteroarylcarbonyl;

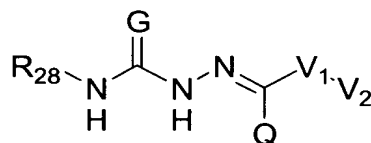
R<sub>25</sub> is selected from the group consisting of substituted or unsubstituted aryl, heteroaryl, heterocyclyl, carbocyclyl, arylalkyl, heteroarylalkyl, and heterocyclalkyl;

R<sub>26</sub> is selected from the group consisting of H, halogen, hydroxy, amino, and substituted or unsubstituted alkyl, carbonylalkyl, and alkylcarbonylalkyl;

R<sub>27</sub> is selected from the group aryl, arylalkyl, heteroarylalkyl, heterocyclyl, heterocyclalkyl, carbocyclyl, arylcarbonylalkyl, and arylalkylcarbonyl,

or a pharmaceutically acceptable salt, ester, or prodrug thereof.

10. The composition of claim 1 wherein the SMIP compound is an aminoazavinyl compound of formula (VII):



VII

wherein,

G is either S or NH;

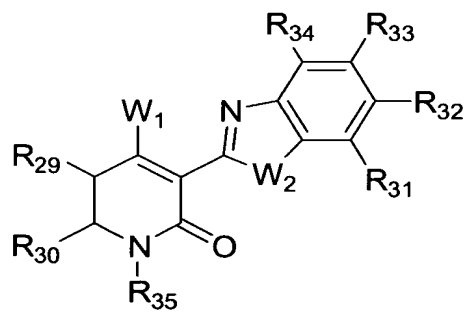
R<sub>28</sub> is selected from the group consisting of H, and substituted or unsubstituted alkyl, aryl, heteroaryl, heteroarylalkyl, arylalkyl, carbocyclyl, carbocyclalkyl, heterocyclyl, and heterocyclalkyl;

Q is selected from the group consisting of hydrogen, substituted alkyl, unsubstituted alkyl, and aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclyl, substituted heterocyclyl, biaryl, substituted biaryl, arylheteroaryl, substituted arylheteroaryl, heteroarylheteroaryl, and substituted heteroarylheteroaryl;

V<sub>1</sub> is selected from the group consisting of alkyl, substituted alkyl, aryl, substituted aryl, arylalkyl, substituted arylalkyl, heteroaryl, substituted heteroaryl, heteroarylalkyl, substituted heteroarylalkyl, alkoxy, substituted alkoxy, aminocarbonyl, alkoxycarbonyl, carboxyl sulfonyl, methanesulfonyl,

and substituted or unsubstituted alkylcarbonyl, arylcarbonyl, aralkylcarbonyl, heteroarylcarbonyl, heteroaralkylcarbonyl, alkylcarbonyloxy, arylcarbonyloxy, aralkylcarbonyloxy, heteroarylcarbonyloxy, heteroaralkylcarbonyloxy, alkylaminocarbonyloxy, arylaminocarbonyloxy, formyl, loweralkylcarbonyl, loweralkoxycarbonyl, aminocarbonyl, aminoaryl, alkylsulfonyl, sulfonamido, aminoalkoxy, alkylamino, heteroarylamino, alkylcarbonylamino, alkylaminocarbonylamino, arylaminocarbonylamino, aralkylcarbonylamino, heteroarylcarbonylamino, arylcarbonylamino, cycloamidino, cycloalkyl, cycloimido, arylsulfonyl and arylsulfonamido;  
V<sub>2</sub> is selected from the group consisting of hydrogen, halogen, alkyl, substituted alkyl, aryl, substituted aryl, arylalkyl, substituted arylalkyl, heteroaryl, substituted heteroaryl, heteroarylalkyl, substituted heteroarylalkyl, alkoxy, substituted alkoxy, aminocarbonyl, alkoxycarbonyl, carboxyl sulfonyl, methanesulfonyl, and substituted or unsubstituted alkylcarbonyl, arylcarbonyl, aralkylcarbonyl, heteroarylcarbonyl, heteroaralkylcarbonyl, alkylcarbonyloxy, arylcarbonyloxy, aralkylcarbonyloxy, heteroarylcarbonyloxy, heteroaralkylcarbonyloxy, alkylaminocarbonyloxy, arylaminocarbonyloxy, formyl, loweralkylcarbonyl, loweralkoxycarbonyl, aminocarbonyl, aminoaryl, alkylsulfonyl, sulfonamido, aminoalkoxy, alkylamino, heteroarylamino, alkylcarbonylamino, alkylaminocarbonylamino, arylaminocarbonylamino, aralkylcarbonylamino, heteroarylcarbonylamino, arylcarbonylamino, cycloamidino, cycloalkyl, cycloimido, arylsulfonyl and arylsulfonamido, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

11. The composition of claim 1 wherein the SMIP compound is an ABIQ compound of formula (VIII):



VIII

wherein,

W<sub>1</sub> is selected from the group consisting of -OH, -OR<sub>36</sub> groups, -NR<sub>37</sub>R<sub>38</sub>;

W<sub>2</sub> is selected from the group consisting of O, S, and NR<sub>39</sub> groups;

R<sub>29</sub> and R<sub>30</sub> join to form a 5 to 6 membered substituted or unsubstituted ring comprising all carbon atoms or at least one O, N, or S atom;

R<sub>35</sub> and R<sub>39</sub> may be the same or different and are selected from the group consisting of H, -OH substituted and unsubstituted alkyl groups, substituted and unsubstituted aryl groups, -C(=O)H, -C(=O)-alkyl groups, and -C(=O)-aryl groups;

R<sub>31</sub>, R<sub>32</sub>, R<sub>33</sub>, and R<sub>34</sub> may be the same or different and are independently selected from the group consisting of H, Cl, Br, F, I, -NO<sub>2</sub>, -CN, -OH, -OR<sub>40</sub> groups, -NR<sub>41</sub>R<sub>42</sub> groups, -C(=O)R<sub>43</sub> groups, -SH groups, substituted and unsubstituted amidinyl groups, substituted and unsubstituted guanidinyl groups, substituted and unsubstituted alkyl groups, substituted and unsubstituted aryl groups, substituted and unsubstituted alkenyl groups, substituted and unsubstituted alkynyl groups, substituted and unsubstituted heterocyclyl groups, substituted and unsubstituted alkylaminoalkyl groups, substituted and unsubstituted dialkylaminoalkyl groups, substituted and unsubstituted arylaminoalkyl groups, substituted and unsubstituted diarylaminoalkyl groups, substituted and unsubstituted (alkyl)(aryl)aminoalkyl groups, substituted and unsubstituted heterocyclylalkyl groups, substituted and unsubstituted aminoalkyl groups, substituted and unsubstituted heterocyclylaminoalkyl groups, substituted and unsubstituted diheterocyclylaminoalkyl groups, substituted and unsubstituted (alkyl)(heterocyclyl)aminoalkyl groups, substituted and unsubstituted (aryl)(heterocyclyl)aminoalkyl groups, substituted and unsubstituted hydroxyalkyl groups, substituted and unsubstituted alkoxyalkyl groups, substituted and unsubstituted aryloxyalkyl groups, and substituted and unsubstituted heterocycloxyalkyl groups;

R<sub>36</sub> is selected from the group consisting of substituted and unsubstituted alkyl groups, substituted and unsubstituted aryl groups, substituted and unsubstituted heterocyclyl groups, substituted and unsubstituted heterocyclylalkyl groups, -C(=O)H, -C(=O)-alkyl groups, -C(=O)-aryl groups, -C(=O)O-alkyl groups, -C(=O)O-aryl groups, -C(=O)NH<sub>2</sub>, -C(=O)NH(alkyl) groups, -C(=O)NH(aryl) groups, -C(=O)N(alkyl)<sub>2</sub> groups, -C(=O)N(aryl)<sub>2</sub>



groups, -C(=O)N(alkyl)(aryl) groups, -NH<sub>2</sub>, -NH(alkyl) groups, -NH(aryl) groups, -N(alkyl)<sub>2</sub> groups, -N(alkyl)(aryl) groups, -N(aryl)<sub>2</sub> groups, -C(=O)NH(heterocyclyl) groups, -C(=O)N(heterocyclyl)<sub>2</sub> groups, -C(=O)N(alkyl)(heterocyclyl) groups, and -C(=O)N(aryl)(heterocyclyl) groups;

R<sub>37</sub> is selected from the group consisting of H, substituted and unsubstituted alkyl groups, substituted and unsubstituted aryl groups, and substituted and unsubstituted heterocyclyl groups;

R<sub>38</sub> is selected from the group consisting of H, substituted and unsubstituted alkyl groups, substituted and unsubstituted aryl groups, substituted and unsubstituted heterocyclyl groups, -OH, alkoxy groups, aryloxy groups, -NH<sub>2</sub>, substituted and unsubstituted heterocyclylalkyl groups, substituted and unsubstituted aminoalkyl groups, substituted and unsubstituted alkylaminoalkyl groups, substituted and unsubstituted dialkylaminoalkyl groups, substituted and unsubstituted arylaminoalkyl groups, substituted and unsubstituted diarylaminoalkyl groups, substituted and unsubstituted (alkyl)(aryl)aminoalkyl groups, substituted and unsubstituted alkylamino groups, substituted and unsubstituted arylamino groups, substituted and unsubstituted dialkylamino groups, substituted and unsubstituted diarylamino groups, substituted and unsubstituted (alkyl)(aryl)amino groups, -C(=O)H, -C(=O)-alkyl groups, -C(=O)-aryl groups, -C(=O)O-alkyl groups, -C(=O)O-aryl groups, -C(=O)NH<sub>2</sub>, -C(=O)NH(alkyl) groups, -C(=O)NH(aryl) groups, -C(=O)N(alkyl)<sub>2</sub> groups, -C(=O)N(aryl)<sub>2</sub> groups, -C(=O)N(alkyl)(aryl) groups, -C(=O)-heterocyclyl groups, -C(=O)-O-heterocyclyl groups, -C(=O)NH(heterocyclyl) groups, -C(=O)-N(heterocyclyl)<sub>2</sub> groups, -C(=O)-N(alkyl)(heterocyclyl) groups, -C(=O)-N(aryl)(heterocyclyl) groups, substituted and unsubstituted heterocyclylaminoalkyl groups, substituted and unsubstituted diheterocyclylaminoalkyl groups, substituted and unsubstituted (alkyl)(heterocyclyl)aminoalkyl groups, substituted and unsubstituted (aryl)(heterocyclyl)aminoalkyl groups, substituted and unsubstituted hydroxyalkyl groups, substituted and unsubstituted alkoxyalkyl groups, substituted and unsubstituted aryloxyalkyl groups, and substituted and unsubstituted heterocycliloxyalkyl groups;

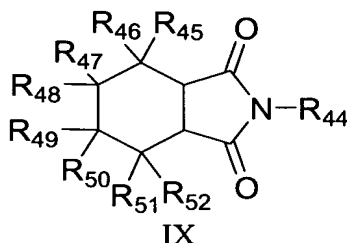
R<sub>41</sub> is selected from the group consisting of H, substituted and unsubstituted alkyl groups, substituted and unsubstituted aryl groups, and substituted and unsubstituted heterocyclyl groups;

R<sub>42</sub> is selected from the group consisting of H, substituted and unsubstituted alkyl groups, substituted and unsubstituted aryl groups, substituted and unsubstituted heterocyclyl groups, -C(=O)H, -C(=O)-alkyl groups, -C(=O)-aryl groups, -C(=O)NH<sub>2</sub>, -C(=O)NH(alkyl) groups, -C(=O)NH(aryl) groups, -C(=O)N(alkyl)<sub>2</sub> groups, -C(=O)N(aryl)<sub>2</sub> groups, -C(=O)N(alkyl)(aryl) groups, -C(=O)O-alkyl groups, -C(=O)O-aryl groups, substituted and unsubstituted aminoalkyl groups, substituted and unsubstituted alkylaminoalkyl groups, substituted and unsubstituted dialkylaminoalkyl groups, substituted and unsubstituted arylaminoalkyl groups, substituted and unsubstituted diarylaminoalkyl groups, substituted and unsubstituted (alkyl)(aryl)aminoalkyl groups, substituted and unsubstituted heterocyclylalkyl groups, -C(=O)-heterocyclyl groups, -C(=O)-O-heterocyclyl groups, -C(=O)NH(heterocyclyl) groups, -C(=O)-N(heterocyclyl)<sub>2</sub> groups, -C(=O)-N(alkyl)(heterocyclyl) groups, -C(=O)-N(aryl)(heterocyclyl) groups, substituted and unsubstituted heterocyclylaminoalkyl groups, substituted and unsubstituted diheterocyclylaminoalkyl groups, substituted and unsubstituted (heterocyclyl)(alkyl)aminoalkyl groups, substituted and unsubstituted (heterocyclyl)(aryl)aminoalkyl groups, substituted and unsubstituted hydroxyalkyl groups, substituted and unsubstituted alkoxyalkyl groups, substituted and unsubstituted aryloxyalkyl groups, and substituted and unsubstituted heterocyclyloxyalkyl groups; and

R<sub>43</sub> is selected from the group consisting of H, -NH<sub>2</sub>, -NH(alkyl) groups, -NH(aryl) groups, -N(alkyl)<sub>2</sub> groups, -N(aryl)<sub>2</sub> groups, -N(alkyl)(aryl) groups, -NH(heterocyclyl) groups, -N(heterocyclyl)(alkyl) groups, -N(heterocyclyl)(aryl) groups, -N(heterocyclyl)<sub>2</sub> groups, substituted and unsubstituted alkyl groups, substituted and unsubstituted aryl groups, -OH, substituted and unsubstituted alkoxy groups, substituted and unsubstituted heterocyclyl groups, substituted and unsubstituted aryloxy groups, heterocyclyloxy groups, -NHOH, -N(alkyl)OH groups, -N(aryl)OH groups, -N(alkyl)O-alkyl groups, -N(aryl)O-alkyl groups, -N(alkyl)O-aryl groups, and -

N(aryl)O-aryl groups, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

12. The composition of claim 1 wherein the SMIP compound is an hydrophthalamide compound of formula (IX):



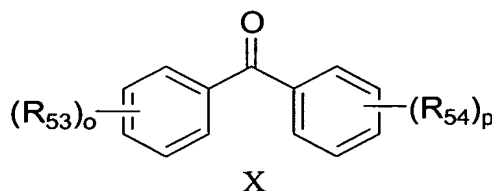
wherein,

R<sub>44</sub> is selected from the group consisting of substituted or unsubstituted aryl, heteroaryl, arylalkyl, heteroarylalkyl, fused arylaryl, unfused arylaryl, fused heteroarylaryl, unfused heteroarylaryl, fused arylheteroaryl, and unfused arylheteroaryl;

R<sub>45</sub>, R<sub>47</sub>, R<sub>49</sub>, and R<sub>51</sub> may be the same or different and are independently selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxylic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl; and

R<sub>46</sub>, R<sub>48</sub>, R<sub>50</sub>, and R<sub>52</sub> may be the same or different and are independently selected from the group consisting of H, halogen, and substituted or unsubstituted alkyl groups, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

13. The composition of claim 1 wherein the SMIP compound is a benzophenone compound of formula (X):



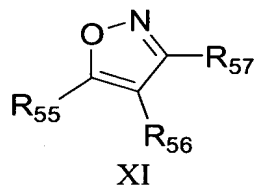
wherein,

R<sub>53</sub> is independently selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxycyclic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl;

R<sub>54</sub> is independently selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxycyclic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl; and

o and p are integers from 0-4, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

14. The composition of claim 1 wherein the SMIP compound is an isoxazole compound of formula (XI):



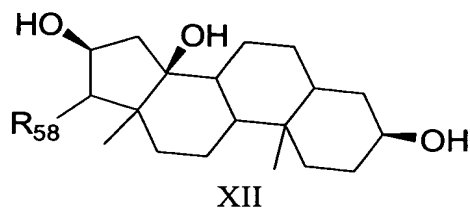
wherein,

R<sub>55</sub> is selected from the group consisting of substituted or unsubstituted aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocyclyl, and heterocyclylalkyl;

R<sub>56</sub> is selected from the group consisting of substituted or unsubstituted aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocyclyl, and heterocyclylalkyl;

R<sub>57</sub> is selected from the group consisting of H, halogen, hydroxy, and substituted or unsubstituted alkyl, aryl, heteroaryl, heterocyclyl, and carbonyl, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

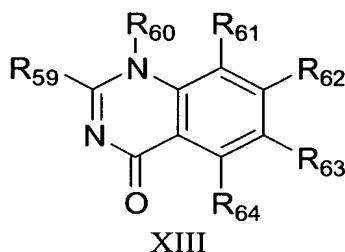
15. The composition of claim 1 wherein the SMIP compound is a sterol compound of formula (XII):



wherein,

R<sub>58</sub> is selected from the group consisting of substituted or unsubstituted aryl, arylalkyl, heteroaryl, heteroarylalkyl, heterocyclyl, and heterocyclylalkyl, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

16. The composition of claim 1 wherein the SMIP compound is a quinazolinone compound of formula (XIII):



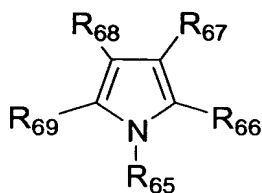
wherein,

R<sub>59</sub> is selected from the group consisting of H, halogen, hydroxy, and substituted or unsubstituted alkyl, aminoalkyl, alkylaminoalkyl, alkoxy, dialkylaminoalkyl, hydroxyalkyl, alkenyl, alkynyl, carbocyclyl, carbocyclylalkyl, heterocyclyl, and heterocyclylalkyl;

R<sub>60</sub> is selected from the group consisting of substituted or unsubstituted aryl, heteroaryl, arylalkyl, heteroarylalkyl, and heterocyclylalkyl; and,

R<sub>61</sub>, R<sub>62</sub>, R<sub>63</sub>, and R<sub>64</sub> may be the same or different and are independently selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxylic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl groups, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

17. The composition of claim 1 wherein the SMIP compound is a pyrrole compound of formula (XIV):



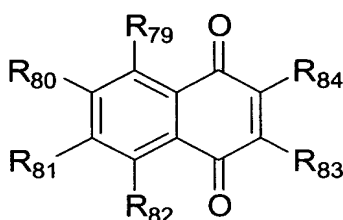
XIV

wherein,

R<sub>65</sub> is selected from the group consisting of H, hydroxy, and substituted or unsubstituted alkyl, aryl, heteroaryl, heteroarylalkyl, arylalkyl, heteroarylaminoalkyl, arylaminoalkyl, heteroaryloxyalkyl, and aryloxyalkyl groups;

R<sub>66</sub>, R<sub>67</sub>, R<sub>68</sub>, and R<sub>69</sub> may be the same or different and are independently selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxylic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminoalkyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl groups, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

18. The composition of claim 1 wherein the SMIP compound is an anthraquinone compound is a compound of Formula (XVI):



XVI

wherein,

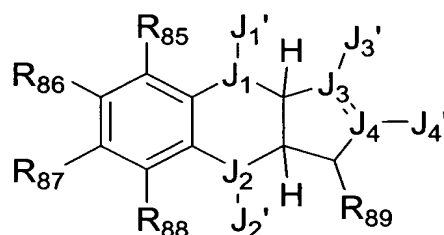
R<sub>79</sub>, R<sub>80</sub>, R<sub>81</sub>, and R<sub>82</sub> may be the same or different and are independently selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxylic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, sulfonyl, aminosulfonyl, alkylaminocarbonyl, aminocarbonyl, arylalkoxy,

heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl groups; and,

R<sub>83</sub> and R<sub>84</sub> are taken together to form a substituted or unsubstituted 5-6 membered ring containing all carbon atoms or 1-2 heteroatoms selected from the group consisting of O, S, and N,

or a pharmaceutically acceptable salt, ester, or prodrug thereof.

19. The composition of claim 1 wherein the SMIP compound is an quinoxaline compound of formula (XVII):



XVII

wherein,

J<sub>1</sub> is either C or N,

J<sub>1</sub>' is selected from the group consisting of H, substituted aryl, unsubstituted aryl, substituted heteroaryl, and unsubstituted heteroaryl;

J<sub>2</sub> is either C or N,

J<sub>2</sub>' is selected from the group consisting of H, substituted aryl, unsubstituted aryl, substituted heteroaryl, and unsubstituted heteroaryl;

J<sub>3</sub> is selected from the group consisting of -CO-, -NH-, and -N=;

if J<sub>4</sub> is -O- then J<sub>4</sub>' is absent; or,

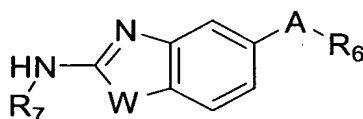
if J<sub>4</sub> is =C- then J<sub>4</sub>' is selected from the group consisting of H and substituted or unsubstituted alkyl, alkoxy, aryl, heteroaryl, heteroarylalkyl, arylalkyl, aminoalkyl, alkylamino, and alkylthio groups; and,

R<sub>85</sub>, R<sub>86</sub>, R<sub>87</sub>, R<sub>88</sub>, and R<sub>89</sub> may be the same or different and are independently selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxylic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, sulfonyl, aminosulfonyl, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino,

heteroarylaminoalkyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl groups,  
or a pharmaceutically acceptable salt, ester, or prodrug thereof.

20. The composition of claim 1 wherein the SMIP compound is a triazine compound, or a pharmaceutically acceptable salt, ester, or prodrug thereof.

21. The composition of claim 1 wherein the SMIP compound is a benzazole compound of formula (XXI):



XXI

wherein,

A is selected from the group consisting of -O-, -S-, -NH-, and -NR<sub>8</sub>-;

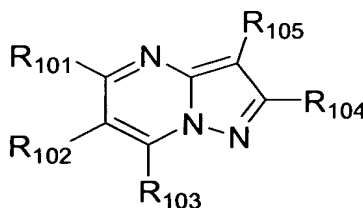
W is selected from the group consisting of -CH<sub>2</sub>-, -O-, -S-, -NH-, and -NR<sub>8</sub>-;

R<sub>7</sub> is selected from the group consisting of carbocyclyl, unfused carbocyclylcarbocyclyl, substituted aryl, unsubstituted aryl, substituted heteroaryl, unsubstituted heteroaryl, substituted fused arylheteroaryl, unsubstituted fused arylheteroaryl, substituted unfused arylaryl and unsubstituted unfused arylaryl;

R<sub>6</sub> is selected from the group consisting of substituted or unsubstituted aryl, and heteroaryl; and,

R<sub>8</sub> is independently substituted or unsubstituted alkyl,  
or a pharmaceutically acceptable salt, ester, or prodrug thereof.

22. The composition of claim 1 wherein the SMIP compound is a pyrazalopyrimidine compound of formula (XXII):



XXII

wherein,



R<sub>101</sub> is selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxcyclic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, sulfonyl, aminosulfonyl, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl groups;

R<sub>102</sub> is selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxcyclic acid, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl groups;

R<sub>103</sub> is selected from the group consisting of H, nitro, halogen, amino, hydroxy, cyano, carboxcyclic acid, trifluoromethyl, and substituted or unsubstituted alkyl, aryl, heteroaryl, alkoxy, alkylcarbonyl, alkylcarbonylamino, alkylaminocarbonyl, aminocarbonyl, arylalkoxy, heteroarylalkoxy, alkylamino, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, and carbocyclyl groups;

R<sub>104</sub> is selected from the group consisting of H and substituted or unsubstituted aryl, heteroaryl, arylalkoxy, heteroarylalkoxy, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, carbocyclylalkyl and carbocyclyl groups;

R<sub>105</sub> is selected from the group consisting of H and substituted or unsubstituted aryl, heteroaryl, arylalkoxy, heteroarylalkoxy, arylalkylamino, arylamino, heteroarylamino, heteroarylaminomethyl, heterocyclyl, heterocyclylalkoxy, heterocyclylalkyl, carbocyclylalkyl and carbocyclyl groups;

wherein at least one of R<sub>104</sub> and R<sub>105</sub> is not H,  
or a pharmaceutically acceptable salt, ester, or prodrug thereof.

23. A pharmaceutical composition of one of claims 1-22, further comprising an antigen.

24. The pharmaceutical composition of claim 23 wherein the antigen is associated with a disease selected from the group consisting of BCG, cholera, plague, typhoid, hepatitis B infection, influenza, inactivated polio, rabies, measles, mumps, rubella, oral polio, yellow fever, tetanus, diphtheria, hemophilus influenzae b, meningococcus infection, and pneumococcus infection.

25. A method of stimulating an immune response in a subject comprising administering a pharmaceutical composition of one of claims 1-22.

26. The method of claim 25 wherein the immune response is the cellular production of one or more cytokines.

27. A method of treating asthma comprising administering to a patient in need thereof, an effective amount of a pharmaceutical composition from one of claims 1-22.

28. A method of vaccinating a subject comprising administering the pharmaceutical composition of one of claims 1-22 prior to, at the same time as, or after administration of a vaccine composition comprising an antigen.

29. A method of vaccinating a subject comprising administering the pharmaceutical composition of claim 23

30. The pharmaceutical composition of claim 1 wherein the SMIP compound is selected from the group consisting of:

N-methyl-4-[(2-{[2-(1-methylethyl)phenyl]amino}-1H-benzimidazol-5-yl)oxy]pyridine-2-carboxamide;

N-methyl-4-[[1-methyl-2-({3-[(trimethylsilyl)ethynyl]phenyl}amino)-1H-benzimidazol-5-yl]oxy]pyridine-2-carboxamide;

N-methyl-4-[(1-methyl-2-{[2-(phenylcarbonyl)phenyl]amino}-1H-benzimidazol-5-yl)oxy]pyridine-2-carboxamide;

4-(methyloxy)-N-[6-(methyloxy)-1,3-benzothiazol-2-yl]-3-nitrobenzamide;

4-({2-[(4-butylphenyl)amino]-1,3-benzothiazol-5-yl}oxy)-N-methylpyridine-2-carboxamide;

N-methyl-4-({1-methyl-2-[(6-pyrrolidin-1-ylpyridin-3-yl)amino]-1H-benzimidazol-5-yl}oxy)pyridine-2-carboxamide;

4-({2-[1,1'-bi(cyclohexyl)-2-ylamino]-1-methyl-1H-benzimidazol-5-yl}oxy)-N-methylpyridine-2-carboxamide;

4-({2-[(4-chlorophenyl)amino]-1-methyl-1H-benzimidazol-5-yl}oxy)-N-1,3-thiazol-2-ylpyridine-2-carboxamide;

4-[(1-methyl-2-{{2-(methyloxy)phenyl}amino}-1H-benzimidazol-5-yl)oxy]-N-[3-(methyloxy)propyl]pyridine-2-carboxamide; and,

4-({2-[(4-ethylphenyl)amino]-1,3-benzoxazol-5-yl}oxy)-N-methylpyridine-2-carboxamide.

31. The pharmaceutical composition of claim 1 wherein the SMIP compound is selected from the group consisting of:

5-chloro-1-{{3-(trifluoromethyl)phenyl}methyl}-1H-indole-2,3-dione;

1-[(4-methylphenyl)methyl]-5-nitro-1H-indole-2,3-dione;

5-chloro-1-{{3-(trifluoromethyl)phenyl}methyl}-1H-indole-2,3-dione;

1-methyl-6,7-bis(methyloxy)-2-{{3-(methyloxy)phenyl}carbonyl}-1,2,3,4-tetrahydroisoquinoline;

1-methyl-6,7-bis(methyloxy)-2-(naphthalen-2-ylcarbonyl)-1,2,3,4-tetrahydroisoquinoline; and,

[2-(trifluoromethyl)phenyl]methyl 3-[4-(aminocarbonyl)phenyl]-2-cycloheptyl-1-oxo-1,2,3,4-tetrahydroisoquinoline-4-carboxylate.

32. The pharmaceutical composition of claim 1 wherein the SMIP compound is selected from the group consisting of:

ethyl 4-{{5-[3,4-bis(methyloxy)phenyl]-7-(trifluoromethyl)pyrazolo[1,5-a]pyrimidin-3-yl}carbonyl}piperazine-1-carboxylate;

5-[3,4-bis(methyloxy)phenyl]-3-(piperidin-1-ylcarbonyl)-7-(trifluoromethyl)pyrazolo[1,5-a]pyrimidine;

5-[3,4-bis(methyloxy)phenyl]-N-methyl-N-(2-pyridin-2-ylethyl)-7-(trifluoromethyl)pyrazolo[1,5-a]pyrimidine-2-carboxamide;

5-propyl-2-thien-2-ylpyrazolo[1,5-a]pyrimidin-7-ol;

anthra[1,2-c][1,2,5]thiadiazole-6,11-dione;

benzo[b]oxanthrene-6,11-dione;

ethyl 6,11-dioxo-6,11-dihydrobenzo[b]phenazine-2-carboxylate;

N,N-dimethyl-9,10-dioxo-9,10-dihydroanthracene-1-sulfonamide; and,

2-(trifluoromethyl)-3-{{3,4,5-tris(methyloxy)phenyl}carbonyl}naphtho[2,3-b]furan-4,9-dione.

33. The pharmaceutical composition of claim 1 wherein the SMIP compound is selected from the group consisting of:

2-(2-oxopropyl)-2-phenyl-1H-indene-1,3(2H)-dione;

5,6-dichloro-2-[2-chloro-5-(trifluoromethyl)phenyl]-1H-isoindole-1,3(2H)-dione;

ethyl 4-{5-[(3-nitrophenyl)carbonyl]-1,3-dioxo-1,3-dihydro-2H-isoindol-2-yl}benzoate;

5,6-dichloro-2-[2-chloro-5-(trifluoromethyl)phenyl]-1H-isoindole-1,3(2H)-dione;

2-(4-amino-2-oxo-1-propyl-1,2-dihydroquinolin-3-yl)-1H-benzimidazole-6-carbonitrile;

4-amino-6-fluoro-7-({[4-(methyloxy)phenyl]methyl}amino)-3-[5-(4-methylpiperazin-1-yl)-1H-benzimidazol-2-yl]quinolin-2(1H)-one;

6-chloro-3-(5-chloro-1H-benzimidazol-2-yl)-4-{{2-(dimethylamino)ethyl}amino}quinolin-2(1H)-one; and,

4-amino-5-(1H-benzimidazol-2-yl)-1-methyl-1,7-dihydro-6H-pyrazolo[3,4-b]pyridin-6-one.

34. The pharmaceutical composition of claim 1 wherein the SMIP compound is selected from the group consisting of:

3-bromo-4-{{[(2-fluorophenyl)methyl]oxy}-5-(methyloxy)benzaldehyde thiosemicarbazone};

2-[4-(3-chlorophenyl)piperazin-1-yl]-5-nitrobenzaldehyde thiosemicarbazone;

4-{{2-(3-chlorophenyl)ethyl}amino}-3-nitrobenzaldehyde thiosemicarbazone;  
(1E)-6,9-dimethyl-2,3,4,9-tetrahydro-1H-carbazol-1-one thiosemicarbazone;  
(2E)-1,1'-bi(cyclohexan)-1-en-2-one thiosemicarbazone;  
4-{{2-(4-chlorophenyl)ethyl}amino}-3-nitrobenzaldehyde thiosemicarbazone;  
4-(diethylamino)-2-{{(4-fluorophenyl)methyl}oxy}benzaldehyde N-(2-piperidin-1-ylethyl)thiosemicarbazone;  
3,4-bis(methyloxy)benzaldehyde (1,1-dioxido-1,2-benzisothiazol-3-yl)(methyl)hydrazone; and,  
(2E)-2-[(4-chlorophenyl)(5-chlorothiophen-2-yl)methylidene]hydrazine carboximidamide.

35. The pharmaceutical composition of claim 1 wherein the SMIP compound is selected from the group consisting of:

5,5-dimethyl-4-methylidene-3-(2,4,6-trinitrophenyl)-1,3-oxazolidin-2-one;  
5-methyl-2-[4-(methyloxy)phenyl]hexahydro-1H-isoindole-1,3(2H)-dione;  
5-methyl-2-(4-methylphenyl)hexahydro-1H-isoindole-1,3(2H)-dione;  
N~2~-(4-chlorophenyl)-6,6-dimethyl-1,6-dihydro-1,3,5-triazine-2,4-diamine;  
(7Z)-7-(furan-2-ylmethylidene)-3-phenyl-3,4-dihydro-2H-[1,3]thiazolo[3,2-a][1,3,5]triazin-6(7H)-one;  
(3aR,9R,9aR)-6,7-dihydroxy-9-[3,4,5-tris(methyloxy)phenyl]-3a,4,9,9a-tetrahydronaphtho[2,3-c]furan-1(3H)-one;  
6-chloro-2-(ethyloxy)-4-methyl-3-(4-nitrophenyl)-3a,4,9,9a-tetrahydro-3H-pyrrolo[2,3-b]quinoxaline;  
ethyl 2-(ethyloxy)-4-methyl-3a,4,9,9a-tetrahydro-3H-pyrrolo[2,3-b]quinoxaline-3-carboxylate;  
ethyl 4-({[2,5-bis(methyloxy)phenyl]amino}methyl)-3,5-dimethyl-1H-pyrrole-2-carboxylate;  
1-{3-[(6-amino-5-nitropyridin-2-yl)amino]propyl}-4-(2-chlorophenyl)-N-[(2S)-2-hydroxypropyl]-1H-pyrrole-3-carboxamide;  
(4-methylphenyl)(5-nitro-2-piperidin-1-ylphenyl)methanone;  
(2S,5R)-N~1~-(4-methylphenyl)-5-phenyl-N~2~-(2-pyridin-2-ylethyl)pyrrolidine-1,2-dicarboxamide;

2-[(3S)-3-(acetylamino)-2-oxopyrrolidin-1-yl]-N-[2-(4-fluorophenyl)ethyl]acetamide;

N-[2-(2,4-dichlorophenyl)ethyl]-4-({(Z)-[(4,4-difluorocyclohexyl)imino][(3S)-3-methylpiperazin-1-yl)methyl}amino)benzamide;

4-[4-(methyloxy)phenyl]-5-phenylisoxazole;

methyl 4-{[4-(1-methylethyl)-2,3-dioxo-7-(trifluoromethyl)-3,4-dihydroquinoxalin-1(2H)-yl)methyl}benzoate;

(3beta,16beta)-3,14,16-trihydroxybufa-20,22-dienolide; and,

2-(aminomethyl)-1-(2-pyridin-2-ylethyl)quinazolin-4(1H)-one.